



Fisheries and Oceans
Canada

Pêches et Océans
Canada

Science

Sciences

Maritimes Region

Canadian Science Advisory Secretariat
Science Advisory Report 2012/010

ASSESSMENT OF SCALLOPS (*PLACOPECTEN MAGELLANICUS*) IN SCALLOP PRODUCTION AREAS 1 TO 6 IN THE BAY OF FUNDY

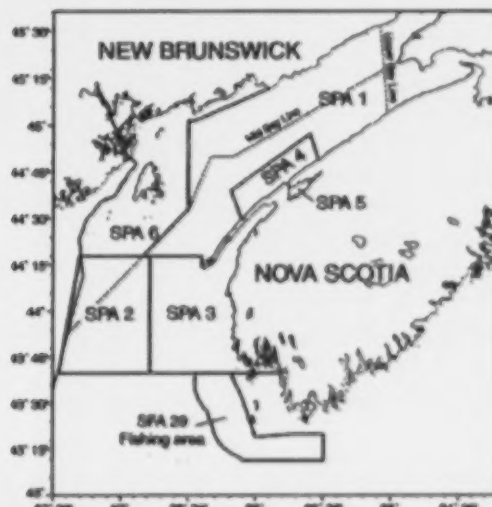
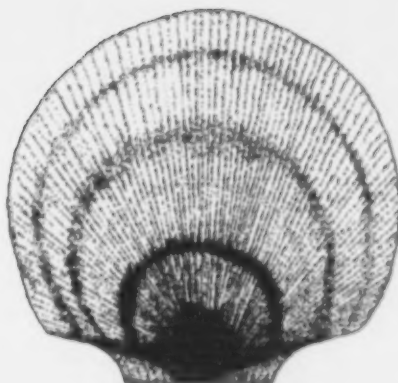


Figure 1. Scallop Production Areas (SPAs) in the Bay of Fundy. Refer to full detail map in Appendix 1 for place names.

Context:

The Bay of Fundy area is fished by three scallop fleets: the Full Bay Fleet, the Mid Bay Fleet, and the Upper Bay Fleet. Full Bay vessels are 45' to 65' while Mid Bay and Upper Bay vessels are generally between 30' to 45'. Full Bay licensed vessels are permitted to fish throughout the Bay of Fundy. The Mid Bay license holders have access to all areas north of the Mid Bay line. The Upper Bay licence holders are restricted to the upper reaches of the bay. The fishery has been managed using limited entry, gear size limits, seasonal closures, minimum shell height, meat count, and individual meat weight restrictions. The gear width limit is 5.5 m with a ring size of not less than 82 mm inside diameter. Quotas were introduced in 1997. The Full Bay Fleet operates under an Individual Transferable Quota (ITQ) system while the Mid and Upper fleets fish with competitive quotas. Total Allowable Catches (TACs) are set and landings are reported in terms of meat weights (adductor muscles).

Scallops in Scallop Production Areas (SPAs) 1 to 6 in the Bay of Fundy are assessed according to a framework conducted in 2002.

This Science Advisory Report is from the Fisheries and Oceans Canada, Maritimes Region Science Advisory Meeting of 16–17 November 2011, to assess the status of Bay of Fundy scallops. The objectives of this meeting were to: (1) assess the status of scallop stocks by SPA taking into account available commercial and survey information, (2) present the bycatch species from all available data, (3) evaluate possible habitat impacts of the fishery, and 4) evaluate the different harvest levels for the 2011/2012 fishery and interim harvest levels for 2012/2013 fishery using the established exploitation reference points. Additional publications from this process will be posted as they become available on the DFO Science Advisory Schedule at <http://www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm>.

SUMMARY

General

- Problems with the predictions from the population models for Scallop Production Area 1A, 1B, 3 and 4 were identified in the 2009 assessment, and scientific advice on stock status was provided for the 2010/2011 fishery based on trends in survey indices and commercial catch rate time series. In the interim, improvements to the growth models, redefinition of the survey area, and alignment of catch and survey timing in the model for SPA 3 have been incorporated into this year's assessment advice.
- Observer coverage has not been routinely available for the scallop fleets in the Bay of Fundy. However, as part of a *Species-At-Risk* project, observer coverage was funded for the inshore scallop fishery in the Bay of Fundy and approaches in 2008 and 2009. Estimated discards were reported for all species.
- As in previous assessments of these SPAs, future catch levels have been evaluated for the modelled production areas in terms of a reference exploitation rate of 0.15, and whether or not the proposed catch would result in a decrease in biomass from the current year.
- Forecasts of biomass for 2012 and 2013 require estimates of expected biomass growth (and condition) and natural mortality for future years. At present these estimates are based on current conditions and, therefore, may not reflect actual changes over the next two years.
- Development of an estimate of the spatial footprint of the Bay of Fundy scallop fishery is underway.

SPA 1A

- Landings were 278 t for the Full Bay Fleet during the 2010/2011 fishing year against a Total Allowable Catch (TAC) of 300 t. An interim TAC of 100 t was set for 2011/2012. The average commercial catch rate in 2010/2011 declined from that in 2009/2010 and was below the long-term median.
- Since the above average 1998 year-class recruited to the fishery in this area, recruitment to the fishery has been low and the abundance of commercial size scallops has been fished down. Recruitment to the fishery is expected to be at very low levels for at least the next two years.
- The condition factor (meat weight for 100 mm shell) had decreased from 2008 to 2010 but increased in 2011 for two of the three subareas of SPA 1A.
- The survey index of the abundance of commercial size scallops decreased by 6% in 2011 from 2010, while the biomass index in 2011 increased by 5% from 2010 due to the overall increase in condition.
- Population biomass estimated by the model was 1,147 t (meats) in 2011, unchanged from the estimate for 2010 (1,141 t) and below the median biomass of 1,251 t (1997 to 2010).
- A catch of 200 t for 2011/2012 should result in an exploitation rate (0.16) close to the reference (0.15) and an 8% decline in biomass for 2012.

SPA 1B

- The total landings of all fleets in 2010/2011 were 259.7 t against a TAC of 400 t. The Mid Bay and Upper Bay fleets' landings were close to their respective TACs, while the Full Bay Fleet only landed 83.6 t against a TAC of 203 t over all three subareas. Economic reasons were reported as being responsible for the reduction of Full Bay effort in SPA 1B.
- Commercial catch rates for the Full Bay Fleet in 2011 remained similar to 2010 in 28B and 28C, while indicating a 20% increase in 28D. The Mid Bay 2011 catch rate for 28B was

unchanged from 2010 but had increased by 11% in 28C. The 2011 catch rate for the Upper Bay Fleet was unchanged from 2010 in 28C and 28D.

- The condition factor has declined for all subareas of SPA 1B since 2008 with greatest decline in subarea 28B.
- There do not appear to be any indications in the survey of strong year-classes that could recruit to the fishery in the next two years in any of the areas. Commercial size numbers and biomass from the survey in 2011 have remained similar to estimates from 2010 in 28C and 28D, while declining by 19% for both numbers and biomass in 28B.
- Population biomass estimated by the model was 1,745 t (meats) in 2011, a decrease of 7% from the estimate for 2010 (1,878 t) and below the median biomass of 1,881 t (1997 to 2010).
- A catch of 300 t for 2011/2012 should correspond to the reference exploitation rate (0.15) and is predicted to result in a 3% decline in biomass.

SPA 2

- This area is considered to be marginal habitat for scallops and is not monitored regularly. SPA 2 was last assessed in 2006 (DFO 2007).

SPA 3

- Total landings for the 2010/2011 fishing year were 73.3 t against a TAC of 50 t. An interim TAC of 100 t was set for October of the 2011/2012 fishing season, and 124.5 t had been landed by October when the fishery was closed.
- Commercial catch rates for the 2011 summer fishery indicated an increase for St. Mary's Bay from 2010 but no change for the Brier/Lurcher area. Generally, October catch rates in Brier/Lurcher are very similar to the summer catch rates in the same area, but the 2011 October catch rate increased by 15% over the 2011 summer rate (and October 2010).
- This year, the survey area outside of St. Mary's Bay has been partitioned according to areas being regularly fished or not fished at all since 2002, and separate survey indices have been developed for these areas.
- The condition factor had increased in St. Mary's Bay from 2006 to 2010 but declined in 2011. Outside of the bay, the condition factors had declined since 2006 but increased from 2010 to 2011.
- Survey indices for both St. Mary's Bay and the fished area indicate an increase in numbers per tow and biomass for 2011 while there was no change in the estimate for the unfished area from 2010. There is evidence of a larger than average year-class in St. Mary's Bay, which should recruit to the fishery in 2013. Shell height frequencies for fished and unfished areas outside of St. Mary's Bay do not indicate a similar large year-class.
- This year, the population model only used survey data from St. Mary's Bay and the fished area outside of the bay. Population biomass estimated by the model was 796 t (meats) in 2011, an increase of 37% from the estimate for 2010 (579 t) and below the median biomass of 827 t (1996 to 2010).
- A catch of 150 t for 2011/2012 should result in an exploitation rate (0.16) close to the reference (0.15) and no appreciable change in biomass for 2012. This catch includes the 125 t already landed in the fall 2011 fishery.
- In general, the Full Bay Fleet is of the opinion that the assessment underestimates the biomass in the area based on the catch rates of this year's fishery. More work is required to evaluate the consequences of these different perspectives.

SPA 4

- Total landings in 2010/2011 were 136.3 t against a TAC of 140 t. An interim TAC of 100 t was set for 2011/2012.
- The 2010/2011 catch rate changed little from the 2010 catch rate and is above the long-term median.
- The condition factor had declined from 2008 to 2010 but increased in 2011.
- Survey estimates for mean numbers indicate a 14% decline from 2010 to 2011 while survey biomass of commercial size scallops increased by 9%, probably due to the increase in condition. Given the trends in the pre-recruit estimates, low levels of recruitment to the fishery will probably continue for at least the next two years.
- Population biomass estimated by the model was 656 t (meats) in 2011, an increase of 2% from the estimate for 2010 (641 t) and below the median biomass of 767 t (1983 to 2010).
- Catches for 2011/2012 of 100 t should result in an exploitation rate (0.14) close to the reference (0.15) and is predicted to result in an 7% decline in biomass

SPA 5

- Landings in 2011 were 10 t against a TAC of 10 t.
- The 2011 average commercial catch rate increased from 2010 and was above the long-term median.
- The annual survey was discontinued as of 2009 in this SPA at the request of industry.
- The average catch of 10 t over the period 1997–2010 (excluding the high catch in 2004) has not led to marked increases or decreases in commercial catch rates over that time, which would suggest a relatively stable population size at this level of harvest.

SPA 6

- Landings in 2011 were 104 t against a TAC of 140 t.
- Both catch and catch rates for the Mid Bay Fleet have been relatively stable over the last six years. There were no landings recorded for the Full Bay Fleet in the Quota Cap reports of SPA 6 for 2011.
- The condition factor had increased in all subareas of SPA 6 from 2008 to 2010 but declined in 2011. A change in the timing of the survey from September to August may have resulted in a lower measure of condition due to spawning but previous data does not indicate such a large change would be expected to occur for only this reason.
- Survey indices for abundance and biomass decreased in all subareas of SPA 6 between 2010 and 2011. Shell height frequencies suggest that recruitment will be low for the next year. However, there were indications of a stronger than average year-class in 6B (mainly Duck Island Sound) that should recruit to the fishery in two or three years.
- The Mid Bay commercial catch rates suggest that the biomass of commercial size scallops remains unchanged over recent years, while the surveys are indicating decreases in 2011 relative to 2010. If the condition factors continue to decline for all three areas, population biomass may decrease at the current levels of catch.

BACKGROUND

The Bay of Fundy scallop fisheries have a long and well documented history of peer reviewed assessments and the assessment approach has been accepted in previous advisory meetings. Problems with the predictions from the population models were identified in the 2009

assessment (DFO 2010), and scientific advice on stock status was provided for the 2010/2011 fishery based on trends in survey indices and commercial catch rate time series. In the interim, investigations of the population models and the data identified improvements to the growth models, redefinition of the survey area and alignment of catch and survey timing in the model for SPA 3 (See Smith et al. 2012 for details). These improvements have been incorporated into the population models to provide the advice in this report.

As in previous assessments of these SPAs, future catch levels have been evaluated for the modelled production areas in terms of a reference exploitation rate of 0.15, and whether or not the proposed catch would result in a decrease in biomass from the current year. The main goal for this approach was to promote stability in the population biomass until recruitment levels had improved. Recruitment success seems to be determined more by favourable environmental conditions than stock size for scallops in this area.

ASSESSMENT, CONCLUSIONS AND ADVICE

SPA 1 - Inner/Upper Bay of Fundy

SPA 1 covers most of the mid to inner Bay of Fundy. Since 2002, it has been managed as two separate areas: SPA 1A and SPA 1B (Appendix 1). The Full Bay Fleet can fish throughout SPA 1A and 1B. However, the other fleets are restricted to SPA 1B, the Mid Bay Fleet fishing only north of the Mid Bay line, and the Upper Bay Fleet fishing only east of the Upper Bay line.

SPA 1A - Southwest Bay of Fundy

Fishery

Landings were 278 t for the Full Bay Fleet during the 2010/2011 fishing year against a TAC of 300 t (Figure 2). An interim TAC of 100 t was set for the 2011/2012 season. As of the Quota Cap report of 9 November 2011, 0.9 t had been landed from SPA 1A against this interim TAC.

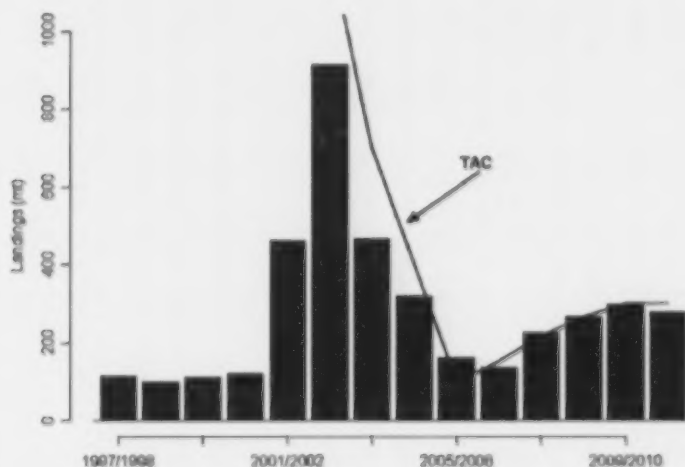


Figure 2. Scallop landings and TAC (meats, t) in SPA 1A.

Assessment

Catch rates declined from 2001/02 to 2005/06 as the strong 1998 year-class, which was mainly located in the 8 to 16 mile area, was fished out. The average catch rate in 2010/2011 (14 kg/h) declined from that in 2009/2010 (15.3 kg/h) and was below the long term median (15.7 kg/h from 1995/96 to 2009/10).

Since the above average 1998 year-class recruited to the fishery in this area, recruitment to the fishery has been low and the abundance of commercial size scallops has been fished down. Recruitment is expected to be at very low levels for at least the next two years. The survey index for abundance of commercial size scallops decreased by 6% in 2011 from 2010, while biomass in 2011 increased by 5% from 2010.

The condition factor (meat weight at 100 mm shell height) used in the growth models has declined in the three survey areas (8-16 mile, 2-8 mile, and Middle Bay South) of SPA 1A from 2008 to 2010. From 2010 to 2011, condition factor increased in the first two areas but continued to decline in the third area. The small increase in the survey biomass reflects the improvement of condition in two of the three areas.

The population model described in Smith and Lundy (2002) with modifications described in Smith et al. (2012) was applied to the combined survey biomass data for the three surveys in this area along with the catch data over the 1997–2011 period. Population biomass estimated by the model was 1,147 t (meats) in 2011, unchanged from the estimate for 2010 (1,141 t) and below the median biomass of 1,251 t (1997 to 2010).

Conclusions and Advice

A catch of 200 t for 2011/2012 should result in an exploitation rate (0.16) close to the reference (0.15) and an 8% decline in biomass for 2012 (Table 1). An evaluation of the model's prediction performance since 2005 indicates that model estimates fall within the 50% credible interval of the prediction from the previous year.

Table 1. Decision table to evaluate catch levels for 2011/2012 for SPA 1A in terms of expected changes in biomass. Potential catches in 2012/2013 are evaluated in terms of the posterior probability of exceeding an exploitation rate of 0.15.

2011/12		Catches in 2012/2013 Pr(exploitation \geq 0.15)				
Catch in t (exploitation)	% Change Biomass	0.1	0.2	0.3	0.4	0.5
100 (0.08)	2.4	64	95	126	161	205
150 (0.12)	-1.7	59	90	119	152	191
200 (0.16)	-7.9	55	83	113	144	181
250 (0.20)	-12.7	51	78	107	137	173
300 (0.24)	-16.6	48	74	100	131	165
350 (0.28)	-21.8	45	70	95	124	157

SPA 1B - Northern/Upper Bay of Fundy

Fishery

In 2007/2008, a TAC sharing formula for the three fleets in SPA 1B was implemented that allocated shares by the three subareas: SFA 28B (excluding SPA 6), SFA 28C, and SFA 28D (Appendix 1). The total quota for all fleets in these areas for 2010/2011 was 400 t and total

landings were 259.7 t. In the 2010/2011 season, the Full Bay Fleet only landed 83.6 t against a TAC of 203 t over all three subareas (Figure 3). Economic reasons were reported as being responsible for the reduction of Full Bay effort in SPA 1B.

Landings for the Mid Bay Fleet were 122.78 t (TAC 142.88 t) in total for SFA 28B and SFA 28C. The TAC for SFA 28C and 28D was 54.12 t for the Upper Bay Fleet, and they landed 53.3 t for 2011. An interim quota of 100 t was set for the Full Bay Fleet for the 2011/2012 fishery. As of the Quota Cap report of 9 November 2011, 0.37 t has been landed by the Full Bay Fleet.

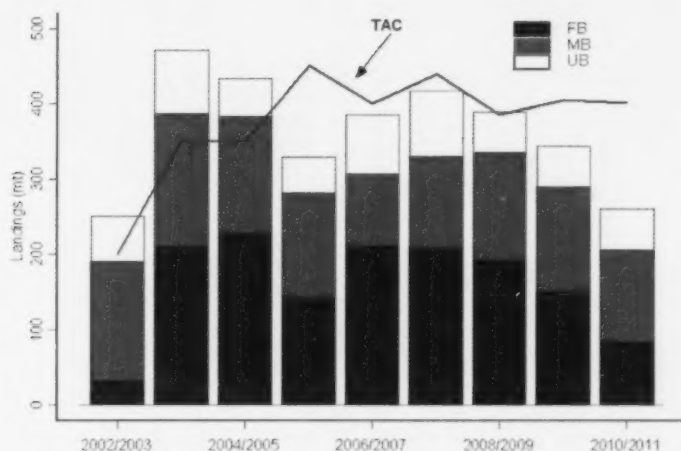


Figure 3. Scallop landings and TAC (meats, t) in SPA 1B (for all fleets). TAC for all fleets in SPA 1B introduced in 2002.

Assessment

Commercial catch rates for the Full Bay Fleet in 2011 remained similar to 2010 in 28B and 28C, while indicating a 20% increase in 28D. The Mid Bay 2011 catch rate for 28B was unchanged from 2010 but had increased by 11% in 28C. The 2011 catch rate for the Upper Bay Fleet was unchanged from 2010 in 28C and 28D.

There do not appear to be any indications in the survey of strong year-classes that could recruit to the fishery in the next two years in any of the areas. Commercial size numbers and biomass from the survey in 2011 have remained similar to estimates from 2010 in 28C and 28D, while declining by 19% for both numbers and biomass in 28B.

The condition factor (meat weight at 100 mm shell height) used in the growth models has declined in all of the subareas of SPA 1B from 2008 to 2011 with the greatest declines in the 28B area. These changes in condition appear to be driving the overall decline in population biomass despite decreasing catches in the last four years.

The population model described in Smith and Lundy (2002) with modifications described in Smith et al. (2012) was applied to the combined survey biomass data and the catch data over the 1997–2011 period. Population biomass estimated by the model was 1,745 t (meats) in 2011, a decrease of 7% from the estimate for 2010 (1,878 t) and below the median biomass of 1,881 t (1997 to 2010).

Conclusions and Advice

A catch of 300 t for 2011/2012 should correspond to the reference exploitation rate (0.15) and is predicted to result in a 3% decline in biomass (Table 2). An evaluation of the model's prediction performance since 2005 indicates that model estimates fall within the 50% credible interval of the prediction from the previous year.

Table 2. Decision table to evaluate catch levels for 2011/2012 for SPA 1B in terms of expected changes in biomass. Potential catches in 2012/2013 are evaluated in terms of the posterior probability of exceeding an exploitation rate of 0.15.

2011/12		Catches in 2012/2013 Pr(exploitation \geq 0.15)				
Catch in t (exploitation)	% Change Biomass	0.1	0.2	0.3	0.4	0.5
200 (0.10)	3.8	100	150	200	256	325
250 (0.12)	1.6	98	147	195	249	315
300 (0.15)	-3.0	91	139	190	244	309
350 (0.18)	-6.9	87	134	180	230	292
400 (0.20)	-9.0	85	130	174	223	281
450 (0.23)	13.5	81	122	165	214	268

SPA 3 - Brier Island, Lurcher Shoal, and St. Mary's Bay

Fishery

Although scallops can be found throughout most of this area, there are three main beds; those around Lurcher Shoal, below Brier Island, and in St. Mary's Bay. St. Mary's Bay (formerly SPA 7) was included with SPA 3 for a combined TAC starting in 1999.

Total landings for the 2010/2011 fishing year were 73.3 t against a TAC of 50 t (Figure 4). An interim TAC of 100 t was set for October of the 2011/2012 fishing season, and 124.5 t had been landed by October when the fishery was closed.

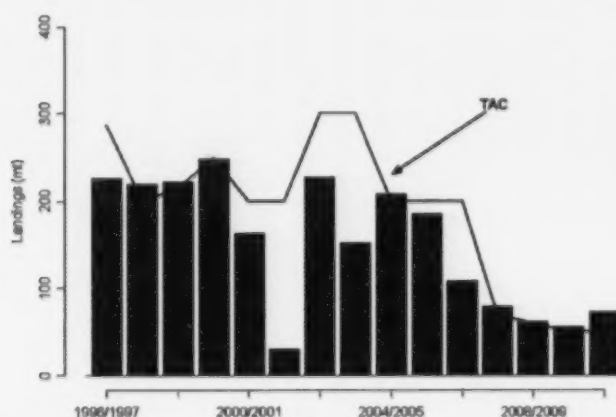


Figure 4. Scallop landings and TAC (meats, t) in SPA 3.

Assessment

Commercial catch rates for the 2011 summer fishery indicated an increase for St. Mary's Bay from 2010 (26.8 vs. 19.6 kg/h) but no change for the Brier/Lurcher area (19.0 vs. 18.9 kg/h). Generally, October catch rates in Brier/Lurcher are very similar to the summer catch rates in the same area, but the 2011 October catch rate (22.2 kg/hr) increased by 15% over the 2011 summer rate (and October 2010).

The survey area outside of St. Mary's Bay has been partitioned according to areas being regularly fished or not fished at all since 2002, and separate survey indices have been developed for these areas. Catches and survey indices were re-aligned to resolve issues from a change in survey timing from August up to 2003 to May/June (2004 to present).

Survey indices for both St. Mary's Bay and the fished area indicate an increase in numbers per tow and biomass for 2011, while there was no change in the estimate for the unfished area from 2010. There is evidence of a larger than average year-class in St. Mary's Bay (mode of 35-37 mm shell height, probably 2 years old), which should recruit to the fishery in 2013. Shell height frequencies for fished and unfished areas do not indicate a similar large year-class.

The condition factor (meat weight at 100 mm shell height) used in the growth models has been increasing in St. Mary's Bay from 2006 to 2010 but declined from 2010 to 2011. Outside of St. Mary's Bay, the condition factors have been declining since 2006 but have shown increases from 2010 to 2011.

The population model described in Smith and Lundy (2002) with modifications described in Smith et al. (2012) was applied to the combined survey biomass data and the catch data over the 1996–2011 period. In particular, this year the population model only used survey data from St. Mary's Bay and the fished area outside of the bay. Population biomass estimated by the model was 796 t (meats) in 2011, an increase of 37% from the estimate for 2010 (579 t) and below the median biomass of 827 t (1996 to 2010).

Conclusions and Advice

A catch of 150 t for 2011/2012 should result in an exploitation rate (0.16) close to the reference (0.15) and no appreciable change in biomass for 2012. This catch includes the 125 t already landed in the fall 2011 fishery (Table 3). An evaluation of the model's prediction performance since 2005 indicates that model estimates fall within the 50% credible interval of the prediction from the previous year.

Table 3. Decision table to evaluate catch levels for 2011/2012 for SPA 3 in terms of expected changes in biomass. Potential catches in 2012/2013 are evaluated in terms of the posterior probability of exceeding an exploitation rate of 0.15.

2011/12		Catches in 2012/2013 Pr(exploitation \geq 0.15)				
Catch in t (exploitation)	% Change Biomass	0.1	0.2	0.3	0.4	0.5
100 (0.10)	7.9	49	75	100	128	160
125 (0.13)	4.7	46	71	95	123	155
150 (0.16)	0.2	46	68	91	117	149
175 (0.18)	-2.9	43	65	88	114	146
200 (0.21)	-7.3	41	63	85	109	140
225 (0.24)	-10.9	39	61	82	106	135
250 (0.26)	-14.3	38	58	79	102	130

In general, the Full Bay Fleet is of the opinion that the assessment underestimates the biomass in the area based on the catch rates of this year's fishery. More work is required to evaluate the consequences of these different perspectives.

SPA 4 - Digby

Fishery

The SPA 4 fishing season extends from October 1st to April 30th. Total landings in 2010/2011 were 136.3 t against a TAC of 140 t (Figure 5). An interim TAC of 100 t was set for the 2011/2012 season. As of the 2011/2012 Quota Cap report of 9 November 2011, 17.4 t had been landed from SPA 4 against this interim TAC.

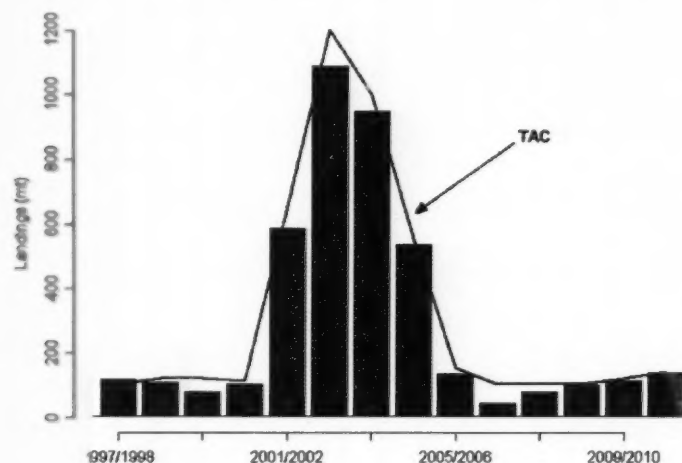


Figure 5. Scallop landings and TAC (meats, t) in SPA 4.

Assessment

Commercial catch rates declined after the above average 1998 year-class recruited to the fishery but have been either relatively stable or slightly increasing since 2005/2006. The 2010/2011 catch rate (18.7 kg/h) changed little from the 2010 catch rate (18.6 kg/hr) and is above the long-term median (16.4 kg/hr, 1983/1984 to 2009/2010).

Survey estimates for mean numbers indicate a 14% decline from 2010 to 2011 while survey biomass of commercial size scallops increased by 9%. Given the trends in the pre-recruit estimates, low levels of recruitment will probably continue for at least the next two years.

The condition factor (meat weight at 100 mm shell height) used in the growth models decreased from 2008 to 2010 with a 23% increase from 2010 to 2011. The increase in the condition factor is reflected in the increase in biomass despite the decrease in numbers in the survey.

The population model described in Smith and Lundy (2002) with modifications described in Smith et al. (2012) was applied to the combined survey biomass data and the catch data over the 1983–2011 period. Population biomass estimated by the model was 656 t (meats) in 2011, an increase of 2% from the estimate for 2010 (641 t) and below the median biomass of 767 t (1983 to 2010).

Conclusions and Advice

Catches for 2011/2012 of 100 t should result in an exploitation rate (0.14) close to the reference (0.15) and is predicted to result in an 7% decline in biomass (Table 4). An evaluation of the model's prediction performance since 2005 indicates that model estimates fall within the 50% credible interval of the prediction from the previous year.

Table 4. Decision table to evaluate catch levels for 2011/2012 for SPA 4 in terms of expected changes in biomass. Potential catches in 2012/2013 are evaluated in terms of the posterior probability of exceeding an exploitation rate of 0.15.

2011/12		Catches in 2012/2013 Pr(exploitation \geq 0.15)				
Catch in t (exploitation)	% Change Biomass	0.1	0.2	0.3	0.4	0.5
100 (0.14)	- 6.7	36	50	66	82	101
120 (0.17)	-11.3	34	49	64	79	98
140 (0.20)	-14.0	32	46	60	76	93
160 (0.23)	-17.8	30	44	58	73	90
180 (0.26)	-20.2	29	43	56	70	87
200 (0.29)	-25.9	27	40	52	66	81

SPA 5 - Annapolis Basin

Fishery

The fishery in the Annapolis Basin (SPA 5) is only open to the Full Bay Fleet with the fishing season occurring between January 1st and March 31st. In recent years, landings have varied between 2 and 20 t (Figure 6). Landings in 2011 were 10 t against a TAC of 10 t.

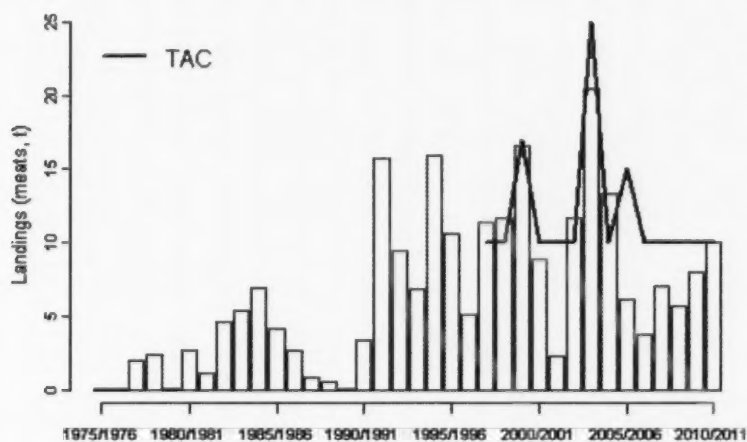


Figure 6. Scallop landings and TAC (meats, t) in SPA 5.

Assessment

The average commercial catch rate in 2011 (19 kg/h) increased from 2010 (14.6 kg/h) and was above the long-term median (18.6 kg/h, 1977–2010).

The annual survey was discontinued as of 2009 in this SPA at the request of industry, and the sampling effort was redirected to the other areas in the Bay of Fundy.

Conclusions and Advice

The average catch of 10 t over the period 1997–2010 (excluding the high catch in 2004) has not led to marked increases or decreases in commercial catch rate over that time, which would suggest a relatively stable population size at this level of harvest.

SPA 6 - Grand Manan and Southwest New Brunswick

Fishery

The areas around Grand Manan and off southwest New Brunswick are designated SPA 6. This area is further divided into 6A, 6B, 6C, and 6D (Appendix 1). Landings to 9 November 2011 were 104 t against a TAC of 140 t (Figure 7).

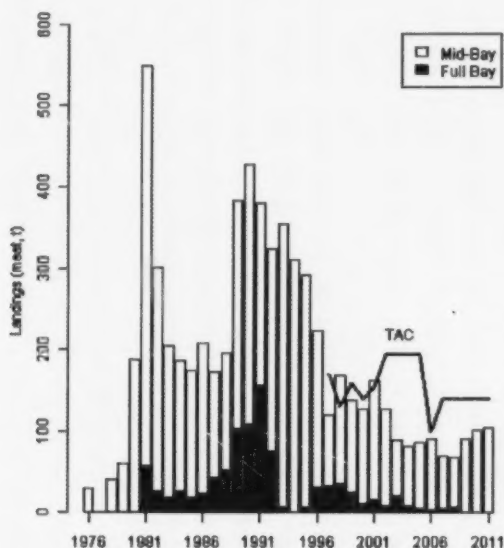


Figure 7. Scallop landings by fleet and TAC (meats, t) in SPA 6.

There were no landings recorded in the Quota Cap report for the Full Bay Fleet despite a TAC of 21 t. This fleet has not caught its quota for the last 7 years as it has directed its effort to the other scallop fishing areas.

The 2011 quota for the Mid Bay Fleet was 119 t. Mid Bay landings for 2011 by area were 23.9 t, 26.5 t, 46.5 t, and 7.0 t for SPA 6A, B, C, and D, respectively.

Assessment

Catch rates for the Mid Bay Fleet have been relatively stable over the last six years.

Survey indices for abundance and weight decreased in all subareas of SPA 6 between 2010 and 2011. Shell height frequencies suggest that recruitment will be low for the next year.

However, there were indications of a stronger than average year-class in 6B, mainly in the Duck Island Sound area, that should recruit to the fishery in two or three years.

The condition factor (meat weight at 100 mm shell height) used in the growth models increased for 6A, 6B and 6C from 2008 to 2010, but all areas declined from 2010 to 2011. While a change in the timing of the survey from September (in 2010) to August (2011) could explain some of this decline because of spawning condition, previous survey data does not seem to support such a large difference due to spawning condition alone.

Conclusions and Advice

The Mid Bay commercial catch rates suggest that the biomass of commercial size scallops remains unchanged over recent years, while the surveys are indicating decreases in 2011 relative to 2010. If the condition factors continue to decline for all three areas, population biomass may decrease at the current levels of catch.

Sources of Uncertainty

Forecasts of biomass for 2012 and 2013 require estimates of expected biomass growth (and condition) and natural mortality for future years. At present these estimates are based on current conditions and therefore may not reflect actual changes over the next two years.

The possibility of unreported catches was discussed again this year. If these are proportional to catch, it would not influence catch advice. If the proportions of unreported catches relative to reported catch have varied over time, it might impact catch advice.

OTHER CONSIDERATIONS

Scallop removals accounted for in the assessment include landings from the inshore scallop fleets and Food Social and Ceremonial (FSC) catch. Landed recreational and FSC catch by dip netting, diving, tongs, and hand is not recorded and, therefore, not available. Scallop discards by the scallop fishery are presented in the Research Document under Fishery Bycatch. For non-scallop fisheries where bycatch information is available, scallop discards were insignificant compared to discards from the inshore scallop fleet (Gavaris et al. 2010).

Observer coverage has not been routinely available for the scallop fleets in the Bay of Fundy. However, as part of a *Species-At-Risk* project, observer coverage was funded for the inshore scallop fishery in the Bay of Fundy and approaches in 2008 and 2009. Observer coverage occurred in SPA 1, 4, and 5 combined in both 2008 and 2009, at a level of 2% and 3% of the scallop landings, respectively. There was only coverage of SPA 3 in 2008 at a level of 5%, and coverage in SPA 6 only in 2009 at a level of 9%. Estimated discards by total weight were reported for all species in the assessment (Smith et al. 2012).

Development of an estimate of the spatial footprint of the BOF scallop fishery is underway.

DFO and industry will work together to evaluate the consequences of the different perspectives on the biomass estimate in SPA 3 before the fishery opens in June 2012.

SOURCES OF INFORMATION

This Science Advisory Report is from the Fisheries and Oceans Canada, Canadian Science Advisory Secretariat, Regional Advisory meeting of 16–17 November 2011 on Scallops in the Bay of Fundy Assessment. Additional publications from this process will be posted as they become available on the DFO Science Advisory Schedule at <http://www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm>.

DFO. 2007. Stock Assessment Report on Scallops (*Placopecten magellanicus*) in Scallop Production Areas 1 to 6 in the Bay of Fundy. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2007/013.

DFO. 2010. Assessment of Scallops (*Placopecten magellanicus*) in Scallop Production Areas 1 to 6 in the Bay of Fundy. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2010/017.

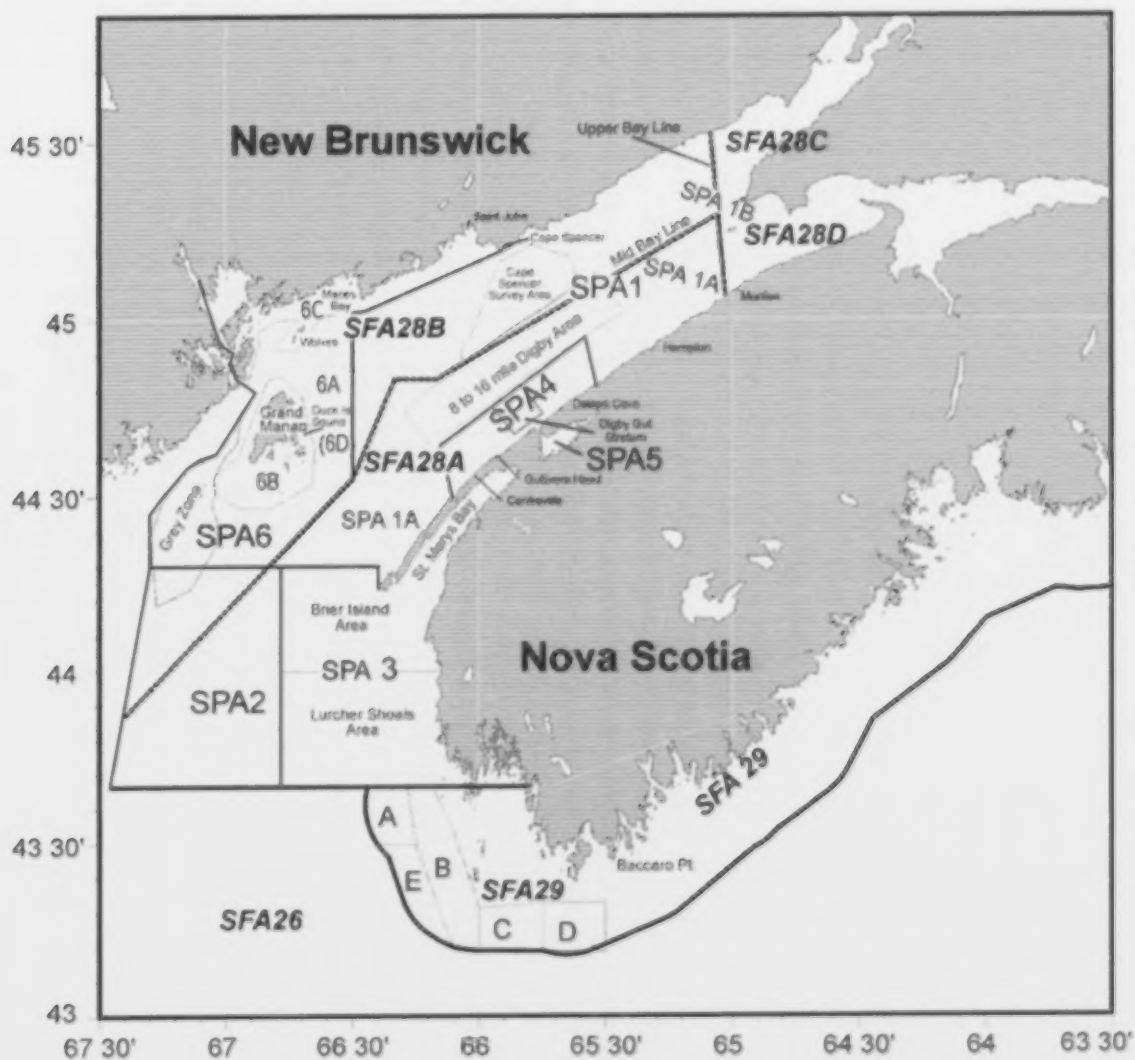
Gavaris, S., K. Clark, A. Hanke, C. Purchase, and J. Gale. 2010. Overview of Discards from Canadian Commercial Fisheries in NAFO Divisions 4V, 4W, 4X, 5Y and 5Z for 2002–2006. Can. Tech. Rep. Fish. Aquat. Sci., 2873: vi + 112 pp.

Smith, S.J., and M.J. Lundy. 2002. Scallop Production Area 4 in the Bay of Fundy: Stock Status and Forecast. DFO Can. Sci. Advis. Sec. Res. Doc. 2002/018.

Smith, S.J., B. Hubley, L. Nasmith, J. Sameoto, H. Bourdages, and A. Glass. 2012. Scallop Production Areas in the Bay of Fundy: Stock Status for 2011 and Forecast for 2012. DFO Can. Sci. Advis. Sec. Res. Doc. 2012/009.

APPENDIX 1

Map showing the locations and place names for inshore scallop grounds.



FOR MORE INFORMATION

Contact: Stephen Smith
Population Ecology Division
Department of Fisheries and Oceans
Bedford Institute of Oceanography
P.O. Box 1006, Dartmouth
Nova Scotia B2Y 4A2

Tel: (902) 426-3317
Fax: (902) 426-1862
E-Mail: Stephen.Smith@dfo-mpo.gc.ca

This report is available from the:

Centre for Science Advice (CSA)
Maritimes Region
Fisheries and Oceans Canada
P.O. Box 1006, Stn. B203
Dartmouth, Nova Scotia
Canada B2Y 4A2

Telephone: 902-426-7070
Fax: 902-426-5435
E-Mail: XMARMRAP@mar.dfo-mpo.gc.ca
Internet address: www.dfo-mpo.gc.ca/csas

ISSN 1919-5079 (Printed)
ISSN 1919-5087 (Online)
© Her Majesty the Queen in Right of Canada, 2012

La version française est disponible à l'adresse ci-dessus.



CORRECT CITATION FOR THIS PUBLICATION

DFO. 2012. Assessment of Scallops (*Placopecten magellanicus*) in Scallop Production Areas 1 to 6 in the Bay of Fundy. DFO Can. Sci. Adv. Sec. Sci. Adv. Rep. 2012/010.